

【CLAIMS】

【Claim 1】 An automatic circulation device of warm water comprising:

a boiler formed with a feed port and a discharging port at the upper side and the lower side thereof, respectively, receiving cool water through the feed port, and
5 discharging the warm water through the discharging port;

an electric heater horizontally installed at the inner lower side of the boiler without contacting the inner lower side and supplying heat to the interior of the boiler;

10 a water tank connected to the feed port of the boiler by means of a feed pipe and feeding the cool water to the boiler;

a heat exchanging section connected to the discharging port of the boiler by means of a discharging pipe and to the water tank by means of a circulation pipe, and transferring heat to the exterior; and

15 a feed valve and a discharging valve respectively installed to the feed pipe and the discharging pipe, and automatically opened and closed by vapor pressure in the boiler.

【Claim 2】 The automatic circulation device of warm water as set forth in claim 1, further comprising a muffler installed to the discharging pipe downstream 20 of the discharging valve and separating the warm water in the discharging valve from the vapor.

【Claim 3】 The automatic circulation device of warm water as set forth in claim 2, wherein the muffler comprises:

25 a muffler body having an internal space with a wide upper side and a narrow lower side, and an inclined surface formed at the bottom surface thereof; and

an inlet pipe and an outlet pipe respectively connected to the upper side and the lower side of the muffler body.

【Claim 4】 The automatic circulation device of warm water as set forth in claim 1, further comprising a temperature controller for measuring the temperature in the boiler and controlling the supply of electric power to the electric heater.

5 【Claim 5】 The automatic circulation device of warm water as set forth in claim 1, further comprising a quick connector installed to an inlet port and an outlet port of the heat exchanging section and connected portions of the discharging pipe and the circulation pipe, and easily connecting and disconnecting the heat exchanging section to the discharging pipe and the circulation pipe.

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【Claim 6】 The automatic circulation device of warm water as set forth in claim 5, wherein the quick connector comprises:

15 a pair of male plugs formed with protrusions symmetrically protruded from both sides of the male plugs 14a and having diameters gradually decreased toward their ends;

 a pair of female plugs having one side into which the male plugs with the protrusions are inserted and the other side on which silicon tubes and a silicon cover are coupled; and

20 a fixing means respectively installed to a male plug case in which the male plugs are installed at the inside, and to a female plug case in which the female plugs are installed at the inside, so as to adjust the depth of the connection of the male and female plugs.

25 【Claim 7】 The automatic circulation device of warm water as set forth in claim 1, wherein the discharging pipe disposed downstream of the discharging valve is divided into two sub-pipes, and the automatic circulation device of warm water further comprises flow rate adjusting devices respectively installed to the sub-pipes and for adjusting the amount of the warm water to be fed to the heat exchanging section.

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【Claim 8】 The automatic circulation device of warm water as set forth in

claim 1, wherein the entire surface of the electric heater is sealed with a stainless film for preventing corrosion.

5 [Claim 9] The automatic circulation device of warm water as set forth in claim 1, wherein the boiler is inclined toward the discharging port at an angle of 3 degrees to 5 degrees.

10 [Claim 10] The automatic circulation device of warm water set forth in claim 1, wherein the discharging valve comprises:

a valve case;
a valve stem penetrating a hole formed in the valve case and having one end to which a nut is coupled and the other end formed with a valve head;
a valve membrane cover coupled with the valve head and securing watertightness between the hole in the valve case and the valve head; and
15 a compressing spring installed around the valve stem, compressed and fixed by the nut and providing elastic force to the valve membrane cover so that it is biased against the hole of the valve case.

20 [Claim 11] The automatic circulation device of warm water as set forth in claim 1, wherein the feed valve comprises a cone-type feed valve and a cylinder-type feed valve installed to the feed pipe in serial.

25 [Claim 12] The automatic circulation device of warm water as set forth in claim 11, wherein the cone-type feed valve comprises:

a valve case;
a valve membrane support installed in the valve case of the cone-type feed valve and formed with a water feeding section having a hollow cone shape; and
a valve membrane fixed between the valve case of the cone-type feed valve and the valve membrane support of the cone-type feed valve and having a lower end movable upward and downward by the external force;
30 wherein the cylinder-type feed valve comprises:

- a valve case;
- a valve body installed in the valve case of the cylinder-type feed valve and freely moved upward and downward; and
- 5 a spring having one end fixed to the lower end of the valve case of the cylinder-type feed valve and the other end coupled with the inner upper side of the valve body of the cylinder-type feed valve, and providing an elastic force so that the valve body of the cylinder-type feed valve is raised.